



**IN THE UNITED STATES PATENT & TRADEMARK OFFICE**

Application Number : 09/843,166 Confirmation No. 8587  
Applicant : Mitchell Corner et al.  
Filed : April 27, 2001  
Tech Cntr/AU : 1764  
Examiner : Ellen M. McAvoy  
Entitled : Lubricant Compositions  
Attorney Reference : 090128-0280189  
Customer Number : 00909

**MAIL STOP ISSUE FEE**

Commissioner for Patents  
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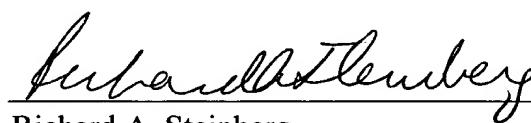
Attached please find the certified copy of the following foreign application from which priority is claimed for this case:

<u>Country</u>	<u>Application Number</u>	<u>Filing Date</u>
Great Britain	9823455.2	October 28, 1998

Date: April 12, 2004

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Signed *A.J. Stevens*.

Dated 2 April 2004

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1. Your reference

MTW 58684

2. Patent application

(The Patent Office will find it)

9823455.2

28 OCT 1998

3. Full name, address and postcode of the or of each applicant (*underline all surnames*)IMPERIAL CHEMICAL INDUSTRIES PLC  
Imperial Chemical House  
Millbank  
London  
SW1 3JFPatents ADP number (*if you know it*)

UK

9823455.2

4. Title of the invention

LUBRICANTS

5. Name of your agent (*if you have one*)CHRISTOPHER ROBERT MILLROSS  
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5542683004

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (*if you know it*) the or each application number

Country

Priority application number  
(*if you know it*)Date of filing  
(*day / month / year*)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

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8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

YES

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*See note (d))*

**Patents Form 1/77**

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Description 3

Claim(s) 0

Abstract 0

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Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (*Patents Form 7/77*)Request for preliminary examination and search (*Patents Form 9/77*)Request for substantive examination  
(*Patents Form 10/77*)Any other documents  
(please specify)

11.

I/We request the grant of a patent on the basis of this application.

Signature

Date

26/10/1994

12. Name and daytime telephone number of person to contact in the United Kingdom

Christopher Robert Millross  
01842 437843**Warning**

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## LUBRICANTS

This invention relates to lubricants, in particular to lubricants for air compressors based on a blend of a polyalkylene glycol and an ester.

Such blends, which have been described in US 4302343, EP 17072, US 4751012 and EP 227477 offer benefits over the conventional mineral oil type lubricants in terms of thermal and oxidative stability, reduced deposit formation, improved lubricity and increased service intervals.

Blends of lower alcohol initiated propoxylates or polypropylene glycol, combined with an aviation type neopentyl polyol ester or diacid ester which are available commercially perform well across a range of performance criteria such as low temperature fluidity and foaming tendency:

However, there are problems with these commercial products due to a tendency to form stable emulsions when mixed with water and it is an unfortunate fact that such mixing is unavoidable, unless air compressors are run in perfectly dry air conditions, due to the moisture in the air condensing out.

Emulsion formation can affect lubrication performance as well as the ability to measure the lubricant level.

Moreover, unlike conventional mineral oils, where the 'condensate' is easily separated from the oil and can be disposed of as water, 'condensate' containing emulsified lubricant is now considered as 'chemical' waste with all the associated costs of disposal.

The presence of water can also cause a reduction in the viscosity of the lubricant (affecting lubricant performance) and a change in the acid value which can increase the possibility of corrosion.

Clearly, the degree to which the lubricant takes up water is of great relevance.

A further problem can arise if such products are incorrectly added to a compressor containing mineral oil due to low miscibility with mineral oil.

It has been found that these problems can be overcome without detrimentally affecting other properties by blending specific polyalkylene glycols with specific esters.

According to one aspect of the invention there is provided a lubricant composition comprising a polyalkylene glycol having the formula

$R-O-(CH_2CH(CH_3)O)_n-CH_3$  where R=C1 to C15 alkyl, preferably C1-4, more preferably C1 and n=1 to 35, preferably 8 to 30,

and an ester.

According to a preferred aspect, the ester is a phthalate, a polyol ester, a diacid ester, or a trimellitate; the preferred phthalates are di-isodecyl phthalate, or 355 trimethyl hexyl phthalate.

Preferably, the composition contains an antifoam agent, an antioxidant and/or an anticorrosion agent.

The invention will be more readily understood from the following examples.

#### Example 1

Tests were carried out using a modified form of ASTM D1401 (a common industry test used as a measure of the demulsibility of lubricant/water mixtures) in which 40 parts by vol of lubricant and 40 parts by vol of water were mixed together to form an emulsion and left to stand.

The results, which together with comments are shown in the Table are based on x-y-z (t) where x is the volume of the oil layer, y is the volume of the water layer, z is the volume of the emulsion layer and t is the time taken to achieve the result; t = 5 is the minimum time for the test and so 40-40-0(5) is the ideal result.

Table 1

Demulsibility (ASTM D1401) - Esters/PAG Combinations							
Sample	Blend Ratio	Result	Oil	Water	Interface	Emulsion	Pass/Fail
1	60:40	1-8-71(60)	cloudy	hazy	well defined	milky	Fail
2	60:40	0-5-75(30)	none	hazy	well defined	milky	Fail
3	53:47	40-40-0(5)	hazy	hazy	well defined	milky	Pas
4	70:30	0-38-42(30)	none	cloudy	well defined	milky	Fail
5	52:48	40-40-0(30)	hazy	clear	well defined	milky	Pas
6	52:48	40-40-0(30)	hazy	clear	well defined	milky	Pas
7	55:45	40-40-0(10)	hazy	clear	well defined	milky	Pas
All include 0.6% commercial antioxidant & anticorrosion package							

Sample 1 = a commercially available blend of butanol initiated propoxylate and pentaerythritol ester

Sample 2 = a commercially available blend of butanol initiated propoxylate and adipate ester

Sample 3 = a blend of methanol initiated methyl end capped propoxylate and a tetra ester of pentaerythritol and 2-ethyl hexanoic acid

Sample 4 = a blend of butanol initiated propoxylate and a tetra ester of pentarythritol and 2-ethyl hexanoic acid

Sample 5 = a blend of methanol initiated methyl end capped propoxylate and isodecyl phthalate

Sample 6 = as Sample 5 plus non- silicone antifoam agent

Sample 7 = a blend of methanol initiated methyl end capped propoxylate and 355 trimethyl hexyl phthalate

In respect of low temperature fluidity, measured as the pour point, i.e. the minimum temperature at which the lubricant could be poured, Samples 5, 6 and 7 (i.e those of the invention) were better (Pour Point -42°C) than the commercially available Sample 2 (Pour Point - 38°C).

Although Samples 5, 6 and 7 had a greater tendency to foam than Sample 1, such foaming could be controlled to achieve similar results by the addition of 50 ppm of, a commercially available, non-silicone antifoaming agent.

In respect of miscibility, Sample 1 was only miscible with oil at a 10% content whereas Sample 5 was miscible up to a content of 25%.

The effect of water on the viscosity and corrosivity was measured using the Beverage Bottle Test (based on a modified version of ASTM D2619) in which the changes in viscosity and acid value of a mixture of 75g sample and 25g water were measured after a period of 2 weeks.

The viscosity (cst at 40° C) was reduced by 3.1 in the case of Sample 1 whereas for Sample 6 the reduction was only 0.6. Similarly, the acid value mgKOH/g) changed to a greater extent for Sample 1 (0.54) than for Sample 6 (0.01).

To assess the water take up, samples were dried using a nitrogen purge until the water content measure 100ppm. Samples were then placed in dessicators at 75° C and the water content measured at intervals.

For both Samples 1 and 6, the water content rose steadily until reaching a constant level after circa 30 days. However, whereas the content of sample 1 was circa 6000 ppm, the content of sample 6 was only 4000 ppm.